

Euptytima (Acari: Oribatida) of the Hawaiian Islands

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ABSTRACT. Six new species of Euptytima (Acari, Oribatida) are described and illustrated: *Oribotritia pulla*, n. sp.; *Eupthiracarus(?) nasutus*, n. sp.; *Phthiracarus curiosus*, n. sp.; *Phthiracarus plenus*, n. sp.; *Phthiracarus reductus*, n. sp.; and *Phthiracarus swiftae*, n. sp. Comments on the other Euptytima found on the the Hawaiian Islands are given.

Ptychoid mites of the Hawaiian Islands are poorly known. Only one species have been described so far: *Oribotritia hawaiiensis* Jacot (Jacot 1928, 1934). During the course of studies of the ptychoid mites of these islands, which I had received from Prof. J. Balogh (material collected during an expedition from the Hungarian Academy of Sciences) and Dr. S.F. Swift from Bishop Museum, Honolulu, I found a series of undescribed species. The purpose of this paper is to describe these species, 2 of which belong in the superfamily Eupthiracaroidea, and the remaining 4 in the superfamily Phthiracaroidea.

Apart from the species mentioned above (which are probably endemic) 2 other species were abundant in the samples: the semicosmopolitan *Phthiracarus anonymus* Grandjean, and the Holarctic *Atropacarus (Atropacarus) striculus* (C.L. Koch) (photo 1), both introduced to the islands, probably from the mainland USA. Two specimens of *Austrophthiracarus lator* Niedbala were found in these samples. It was originally described from Himalah Pradesh in India and is also known from the Far East (USSR) (Niedbala 1982). The presence of this species on the Hawaiian Islands is difficult to explain.

SYSTEMATICS

Oribotritia pulla Niedbala, n. sp. (Figs. 1-12).

Measurements of holotype (all measurements in μm): prodorsum: length 577, width 494, height 241, sensillus 101, interlamellar seta 190, lamellar seta 146, rostral seta 171, exobothridial seta 76.1; notogaster: length 1265, width 893, height 874, seta c_1 260, seta h_1 223, seta ps_1 195; genitoaggenital plate 273x111, anoadanal plate 581x101.

Large species. Color dark brown to black. Integument finely porose. Longitudinal striae present in front and lateral of rostral setae.

Prodorsum with long, well developed lateral carina. Sensillus bar like, weakly rugose. Setae procumbent, smooth, acuminate, with $in > ro > le > ex$.

Notogaster with 14 pairs of normal setae, thin, short and smooth, similar in shape to prodorsal setae. Setae of row c remote from anterior border of notogaster. Vestigial setae f_1 situated a little dorsal of setae h_1 . Five pairs of lyrifissures (ia , im , ip , is , ih) and opening of latero-opisthosomal gland (g_1a) present.

Ventral region. Epimeral setal formula: 3-0-2-2. Infracapitular mentum with h setae very long ($h > h-h$). Five segmented palp with formula: 0-4-0-3-9(1). Division of the genital, aggenital, anal and adanal plates complete. Genital and aggenital plates with 6 and 2 setae respectively. Anal plate with 2 setae and adanal one with 3 setae. Lyrifissure iad lies on the level of ad_3 and an_1 setae. Posterior sinus (SL) at the posterior end of the ventral plicature rounded.

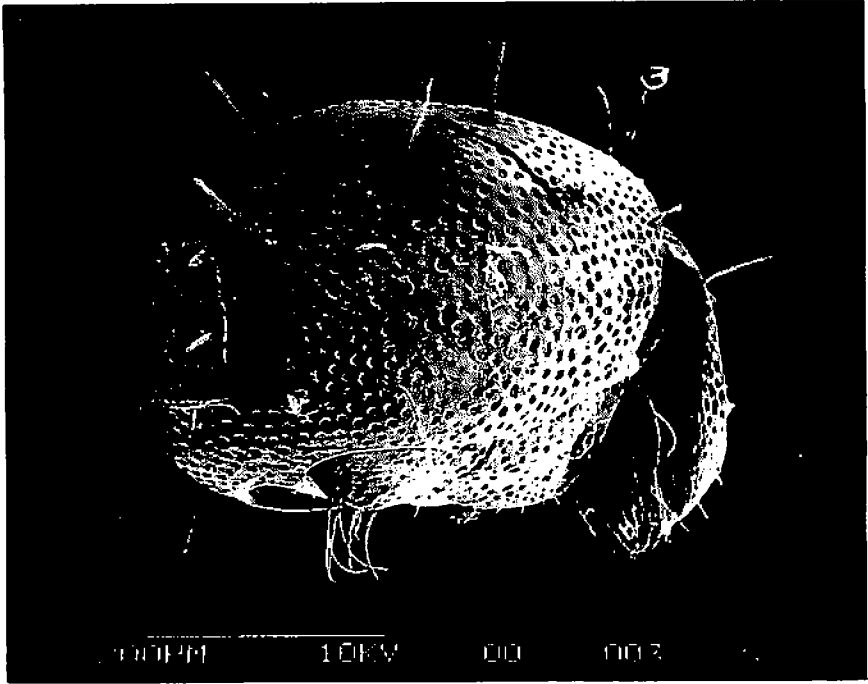


Photo 1. *Atropacarus (Atropacarus) striculus* (C.L. Koch, 1836), lateral view. SEM photomicrograph taken by S.F. Swift.

Tarsi heterotridactylous. Leg setal and solenidial formulae as follows (without tarsi): I: 1-4-5(2)-5(1), II: 1-4-4(1)-4(1), III: 3-2-3(1)-4(1), IV: 3-2-3-3(1). Femur I without dorsodistal tooth. All setae *d* on genua and tibiae shorter than solenidia except on tibia I, where coupled seta *d* is longer than solenidion. Tibia III with four setae. Genu IV without solenidion. Tarsus IV without spinelike seta.

Remarks: *Oribotritia pulla* is similar to *Oribotritia hawaiiensis* Jacot but can be distinguished by obtuse sensillus, mutual distance between interlamellar setae narrower and number of genital and adanal setae (in *O. hawaiiensis* 9 genital and 5 adanal setae).

Etymology: From the Latin word "pullus" meaning dark, blackish, which applies to the color of adult in this species.

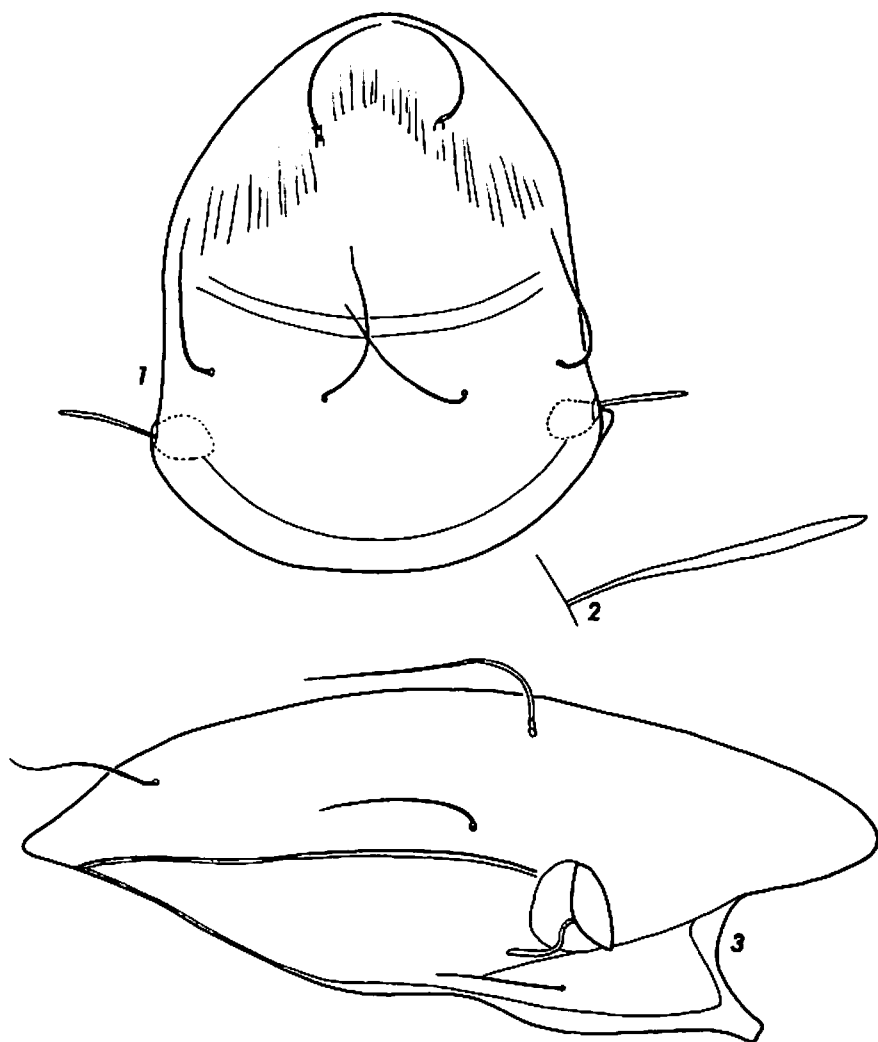
Type data: Holotype (P.DIII) (BPBM 15,832) and one paratype: HAWAIIAN ISLANDS, O'ahu I., Mt Ka'ala Summit, 1225 m, 10.x.1989, ground moss with soil, S.F. Swift.

Holotype deposited in the Bishop Museum, Honolulu; paratype in the Department of Animal Taxonomy and Ecology, University of Poznan.

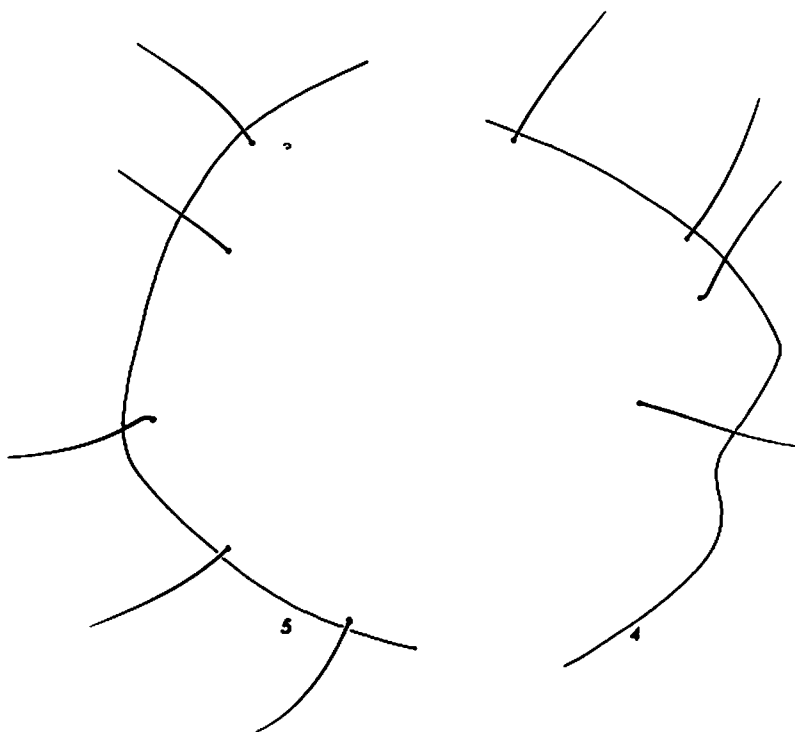
***Euphthiracarus(?) nasutus* Niedbala, n. sp. (Figs. 13-24)**

Measurements of holotype: prodorsum: length 328, width 232, height 121, sensillus 60, 7, interlamellar, lamellar and rostral setae 25, 3, exobothridial setae 20, 2; notogaster: length 583, width, 396, height 418, seta *c*₁ 63, 2, seta *h*₁ 53, 1, seta *ps*₁ 40, 5; genito-aggenital plate 167x80, 8, anoadanal plate 268x60, 6.

Color pale brown or yellow. Integument generally punctate. Prodorsum with single, well developed carina. Stout hump present above the rostrum bearing two rostral setae. Size variable and sur-



Figs. 1-3. *Oribotritia pulla*, n. sp.: 1. prodorsum, dorsal view; 2. sensillus; 3. prodorsum, lateral view.



Figs. 4-5. *Oribotritia pulla*, n. sp.: 4. notogaster, anterior part; 5. notogaster, posterior part.

rounded by characteristic lamellae. Sensillus long, gradually widened, smooth. Bothridial scale behind bothridium. Setae thin, simple, short, similar to notogastral setae. Mutual distance between rostral setae very short, but mutual distance between interlamellar setae very large.

Notogaster with 14 pairs of normal setae, thin, short and smooth. Vestigial setae f_1 and f_2 not visible. Setae c_1 , c_2 and c_3 inserted far from the anterior margin, particularly setae c_1 and c_2 . Five pairs of notogastral lyrifissures (*ia*, *im*, *ip*, *ips*, *ih*) present.

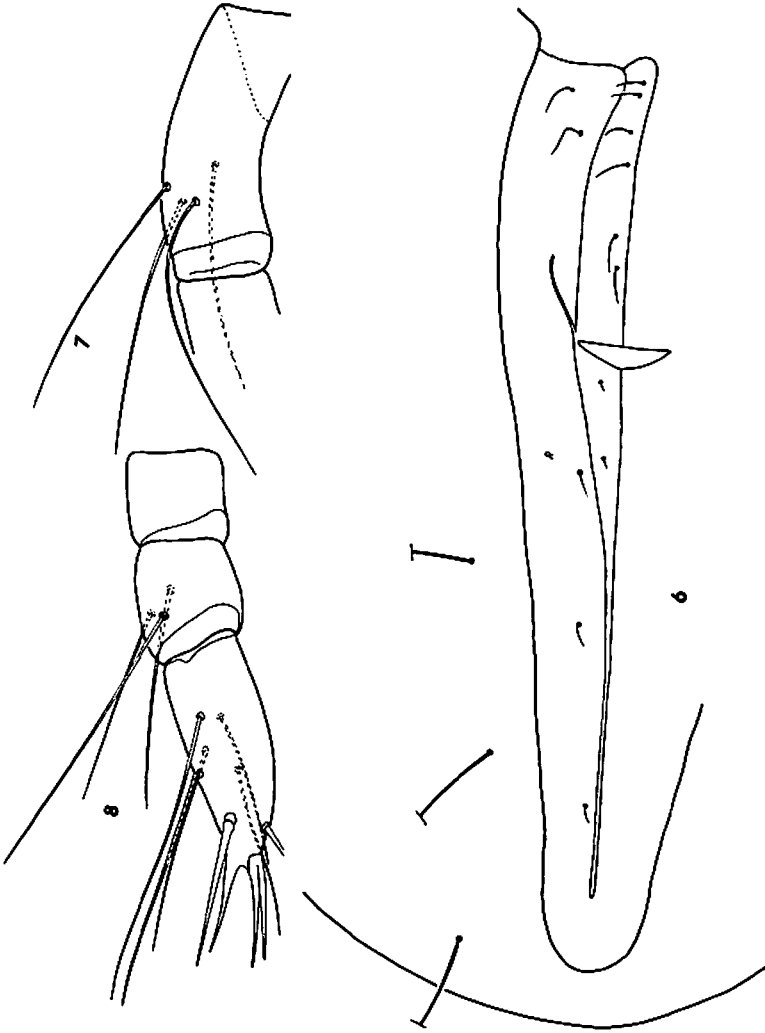
Ventral region. Infracapitulum typically euphthiracaroid. Setae h of mentum very long ($h > h-h$). Palp 3-segmented, with setal and solenidial formula: 2-2-7(1).

Two interlocking triangles present, typical of genus *Euphthiracarus*. Very narrow anal plate completely separated from adanal plate. Four pairs of genital setae, 2 pairs of aggenital, 3 pairs of anal and 3 pairs of adanal setae present. Lyrifissures *iad* located anterior to ad_3 seta. Terminal fissure FT ending above ps_1 .

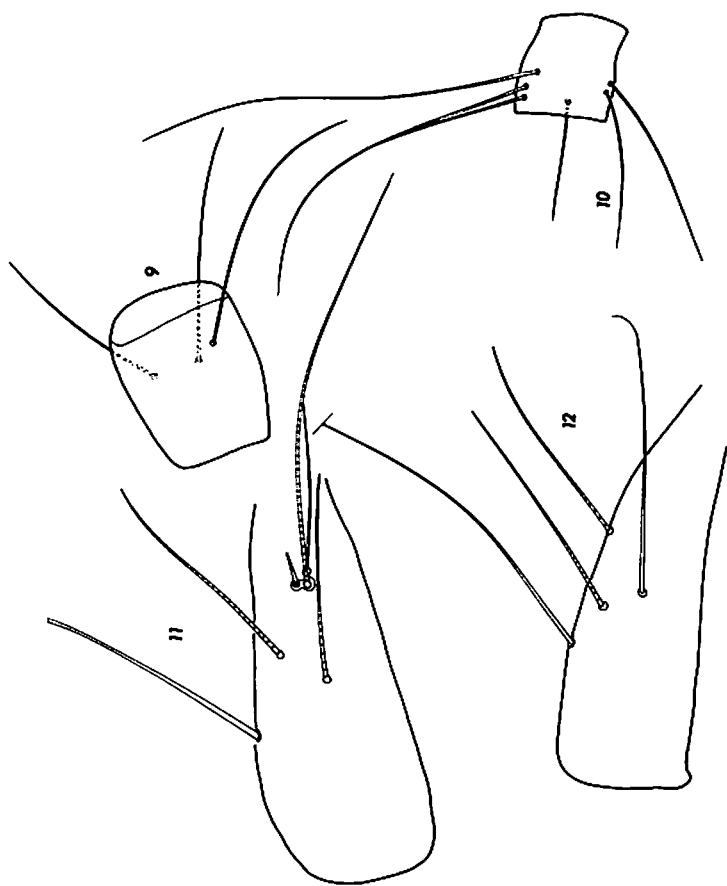
Leg setal and solenidial formulae as follows (except tarsi I, II, III): I: 1-2-3(2)-5(1), II: 1-2-3(1)-2(1), III: 2-2-2(1)-2(1), IV: 2-1-1-2(1)-10. All tarsi monodactylus, similar to tarsi of Phthiracaroida, with two tiny teeth on inner side. All coupled setae d on genu I-III and tibiae I-IV shorter than solenidia. Solenidia and associated setae on tarsi I and II arranged as in figs. 22, 23.

This species is unique among congeneric species in having a large dorsal protruberance on the rostrum.

Remarks: The generic placement of this species is unclear. Interlocking triangles between genital and anal plates and at the end of anoanal plate are typical for the genus *Euphthiracarus*. But this species is readily distinguishable from *Euphthiracarus* (*Euphthiracarus*) and from *Euphthiracarus* (*Brasilotritia*) by position of bothridial scale



Figs. 6-8. *Oribotritia pulla*, n. sp.: 6, genitosagittal and ano-adanal regions; 7, palp, proximal part; 8, palp, distal part.



Figs. 9-12. *Oribotritia pulla*, n. sp.: 9. genu of leg IV; 10. tibia of leg I; 11. tarsus of leg I (partially); 12. tarsus of leg II (partially).

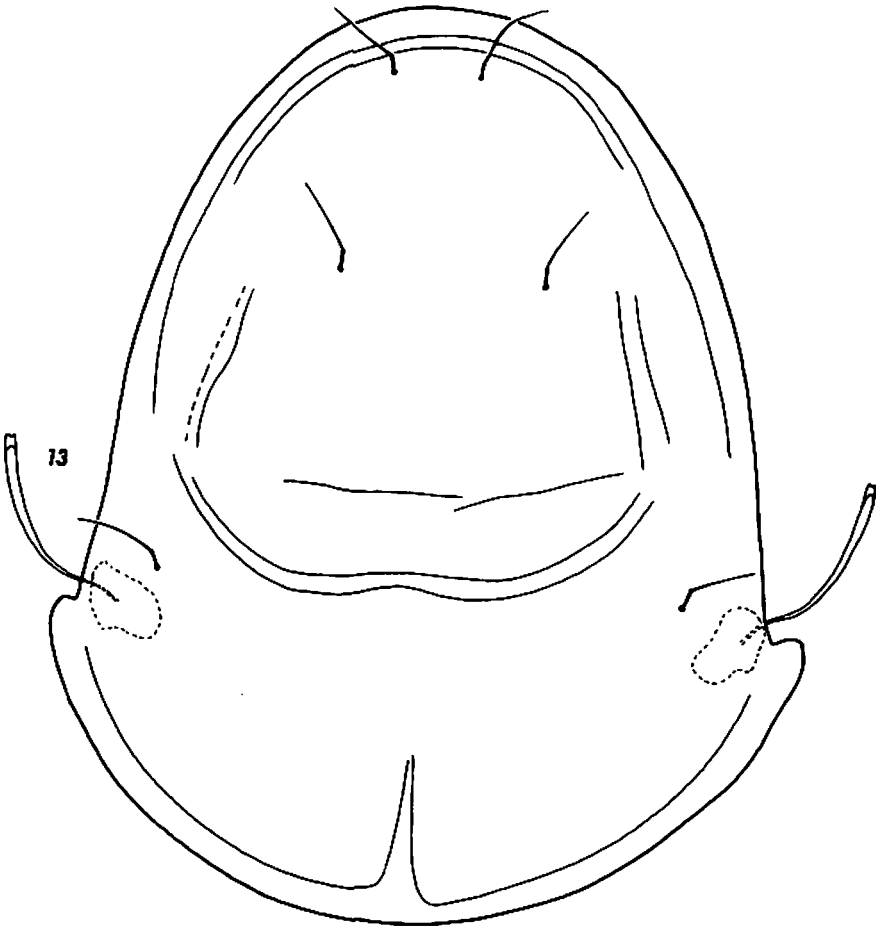
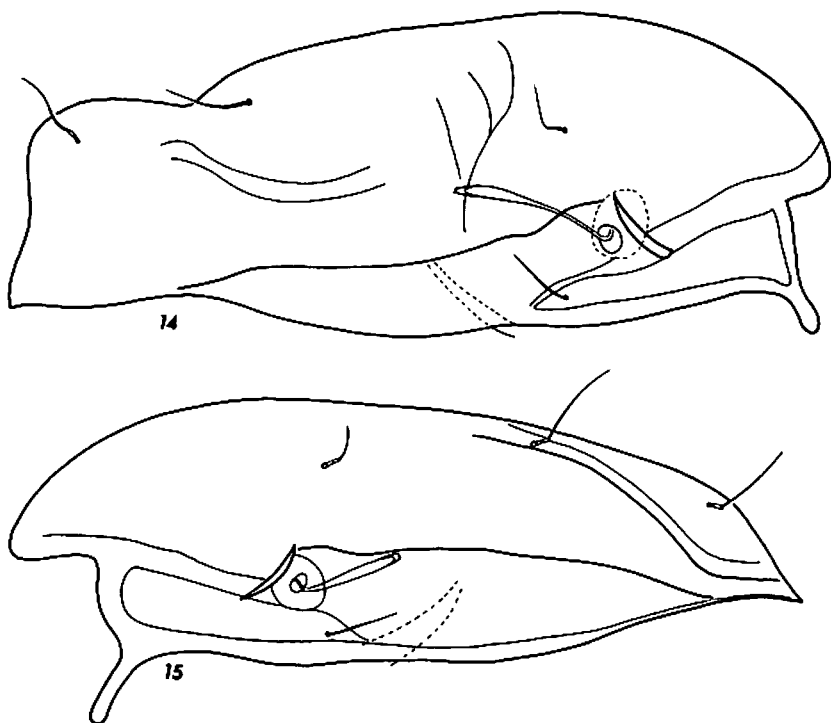


Fig. 13. *Euphthiracarus(?) nasutus*, n. sp.: prodorsum, dorsal view.



Figs. 14–15. *Euphthiracarus(?) nasutus*, n. sp.: 14. prodorsum of paratype, lateral view; 15. prodorsum of holotype, lateral view.

and insertion of prodorsal setae. It resembles members of the genus *Paratritia* Moritz in complete division of anal and adanal plates. It is possible that the species represents a new genus, positioned between *Euphthiracarus* and *Paratritia*. But until I finish my studies on Euphthiracaroidea I will not erect new taxa at the generic level.

Etymology: The specific name “nasutus” is taken from the Latin meaning “large nose” referring to the large protruberance dorsal of rostrum.

Type data: Holotype (p.DLI) (BPBM 15,833) and two paratypes: HAWAIIAN ISLANDS, Maui I., Olinda, Makawao Forest Reserve, 9.x.1968, thick litter and humus under fern trees, J. Balogh.

Holotype and one paratype deposited in the Bishop Museum, Honolulu; one paratype in the Department of Animal Taxonomy and Ecology, University of Poznan.

***Phthiracarus curiosus* Niedbala, n. sp. (Figs. 25–32).**

Measurements of holotype: length 379, width 278, height 177, sensillus 25, 3, interlamellar seta 74, 4, lamellar seta 45, 5, rostral seta 43, 0, exobothridial seta 53, 1; notogaster: length 772, width 521, height 539, seta c_1 65, 8, seta h_1 60, 7, seta ps_1 55, 7; genitoaggenital plates 162x121, anoadanal plates 257x111.

Color light brown. Integument finely porose.

Prodorsum with dorsal and lateral regions fused with characteristic incisions on the antiaxial sides. Lateral carinae absent. Sensillus short, with clavate head covered by very fine spines. All setae thin and short, smooth, $in > ex > le > ro$.

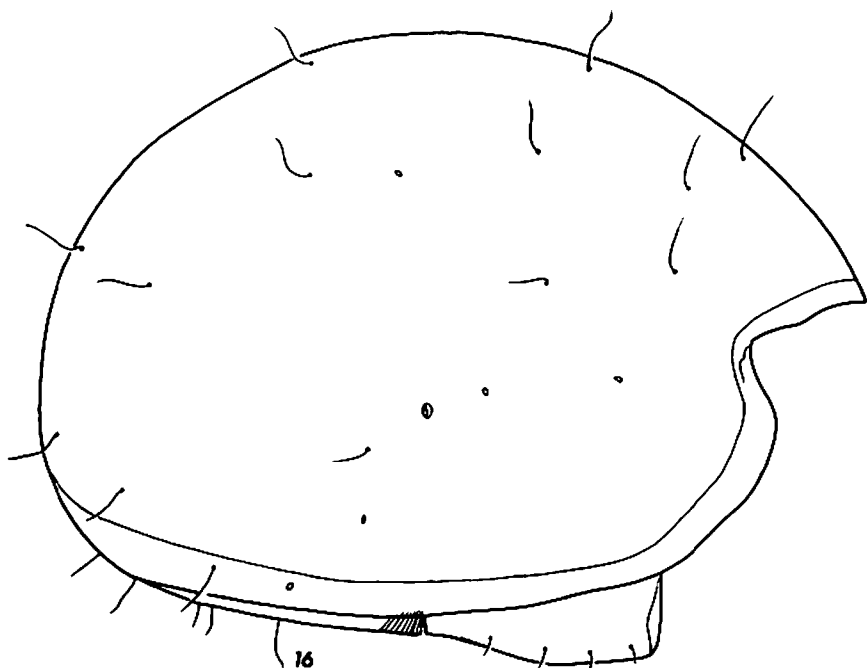


Fig. 16. *Euphythiracarus(?) nasutus*, n. sp.: notogaster, lateral view.

Notogastral, normal setae similar in structure to prodorsal setae. There are short, fine, a little flagellate, $c_1 < c_2 - d_1$. Setae c_1 and c_2 remote from anterior border, seta c_3 near to anterior border. Vestigial setae f_1 situated ventrad seta h_1 . Four pairs of typical notogastral lyrifissures *ia*, *im*, *ip*, *ips* present.

Ventral region typically phthiracaroid. Setae h of infracapitulum short, $h < h-h$. Setal formula for genitoaggenital plate: 4+2; 3. Anoadanal plate with five pairs of short setae, all of similar length.

Leg chaetotaxy of the "complete type", with the setal formulae: I: 1-4-2-5-17-1; II: 1-3-2-3-12-1; III: 2-2-1-2-10-1; IV: 2-1-1-2-10-1 and solenidiotaxy is I: 2-1-3; II: 1-1-2; III: 1-1-0; IV: 0-1-0. Setae a'' on tarsus I and a'' and ft'' on tarsus II bent distally.

Remarks: This species is unique among the Phthiracaridae in having fused dorsal and lateral regions on prodorsum.

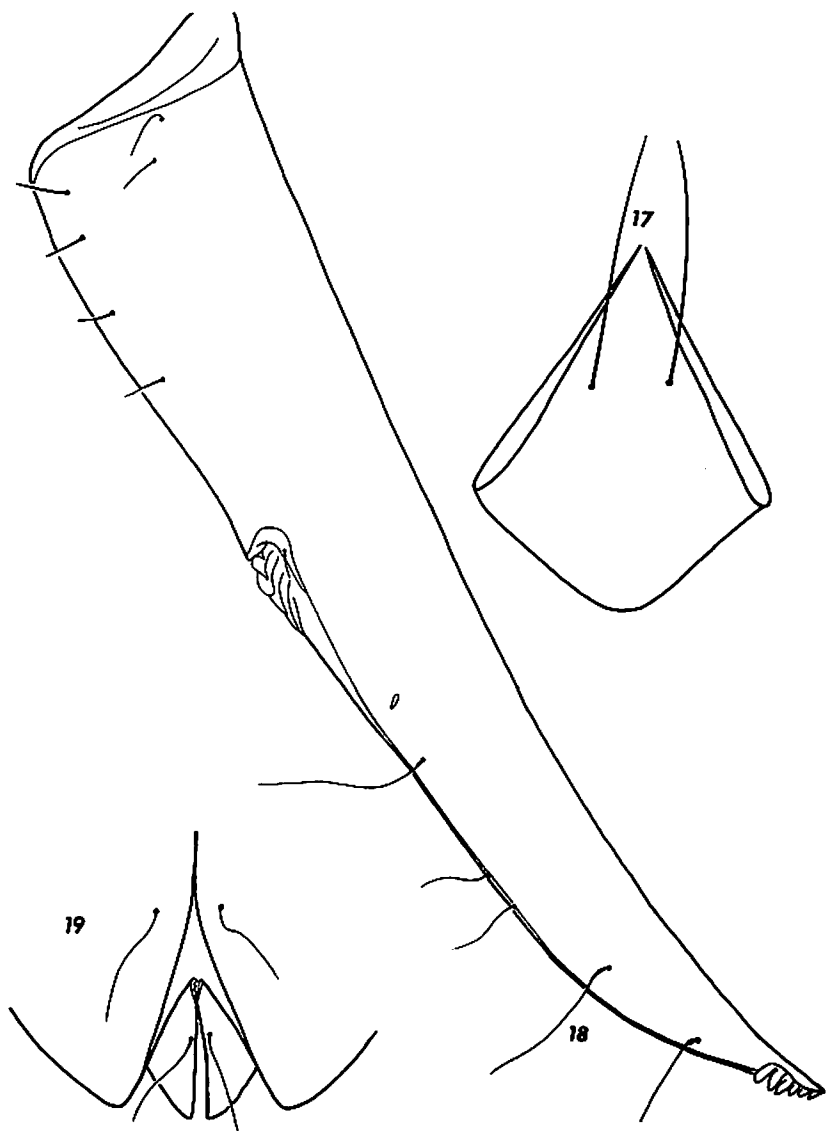
Etymology: The name "curiosus" applies to the fused dorsal and lateral regions on prodorsum.

Type data: Holotype (p.MXLII) (BPBM 15,834) and five paratypes: HAWAIIAN ISLANDS: O'ahu I., Mt. Ka'ala summit, 1225 m, 10.x.1989, ground moss with soil, S.F. Swift.

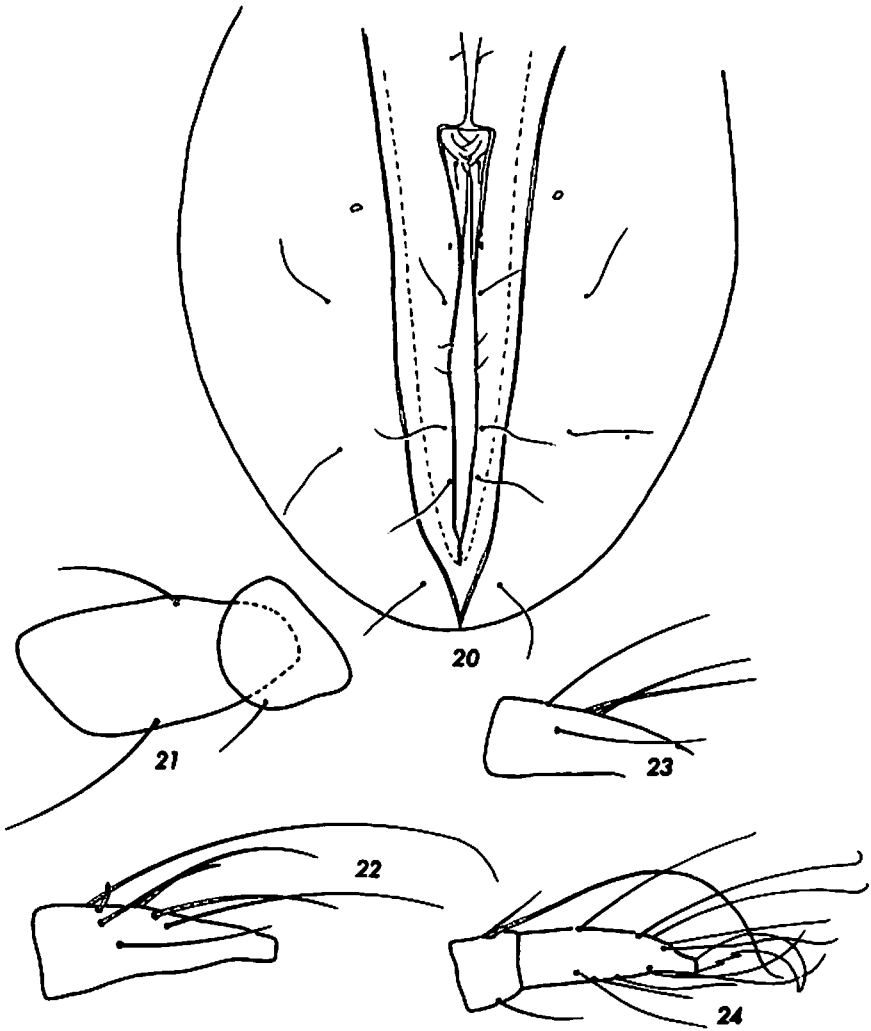
Holotype and three paratypes deposited in the Bishop Museum, two paratypes in the Department of Animal Taxonomy and Ecology, University of Poznan.

Phthiracarus plenus Niedbala, n. sp. (Figs. 33-40).

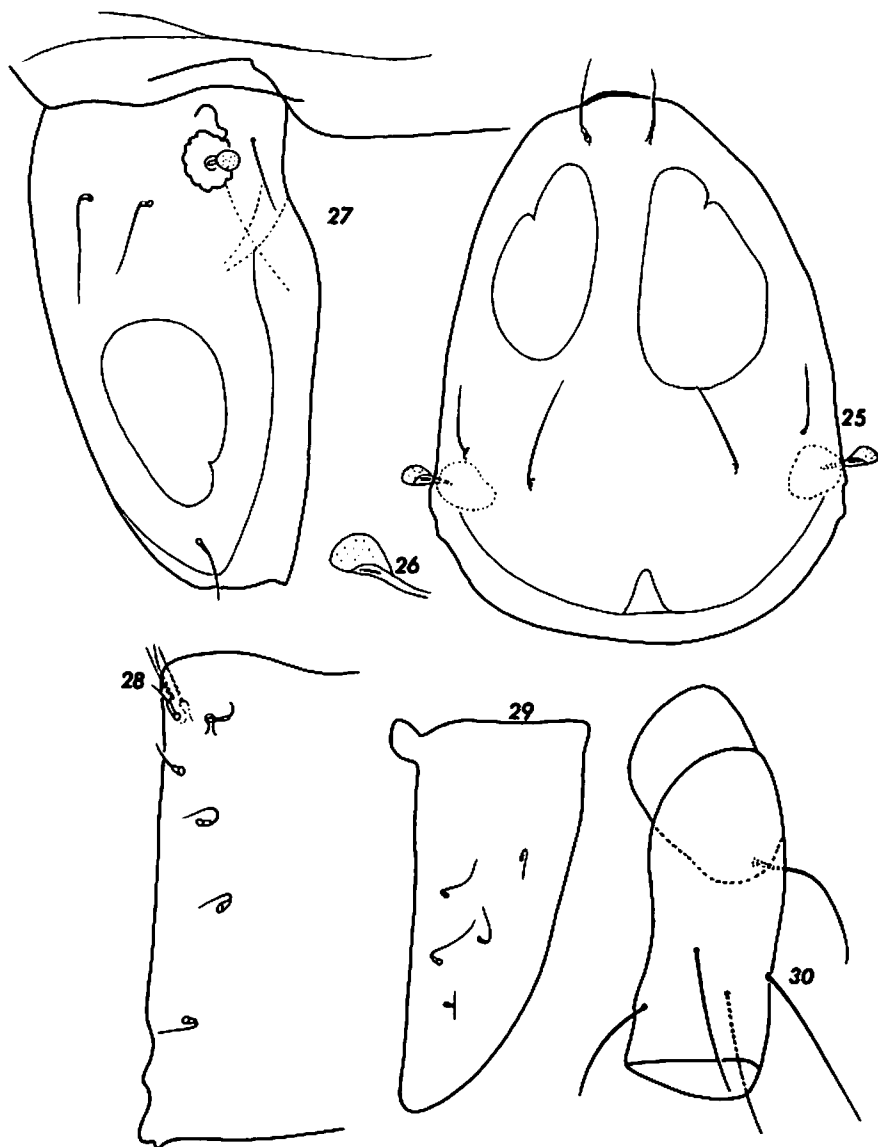
Measurements of holotype: prodorsum: length 318, width 273, height 151, sensillus 37, 9, interlamellar seta 50, 6, lamellar seta 40, 5, rostral and exobothridial setae 35, 4;



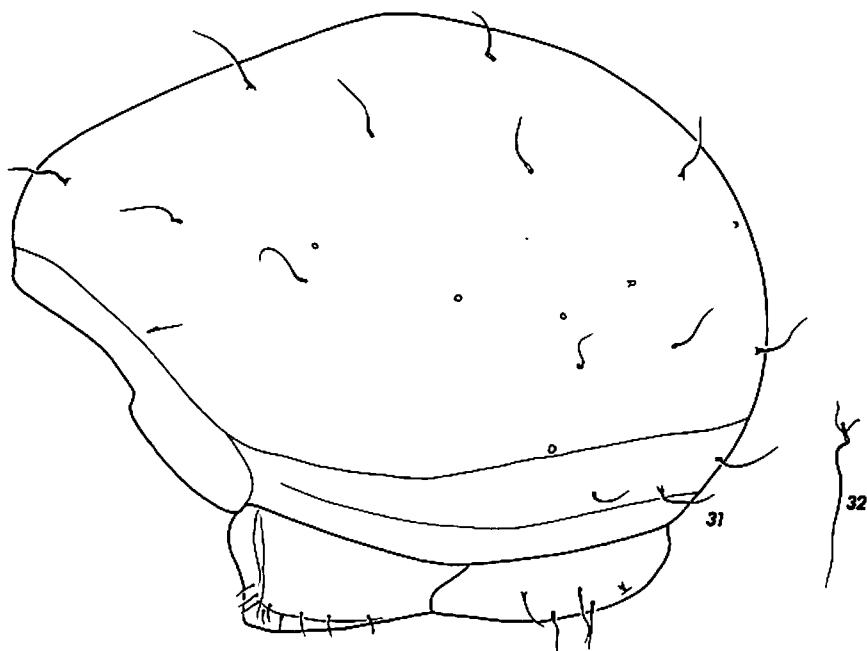
Figs. 17–19. *Euphthiracarus(?) nasutus*, n. sp.: 17. mentum of infracapitulum; 18. genitoaggenital and anoadanal regions; 19. anoadanal regions, posterior aspect.



Figs. 20-24. *Euphthiracarus(?) nasutus*, n. sp.: 20. venter, posterior aspect; 21. trochanter and femur of leg I; 22. tarsus of leg I (partially); 23. tarsus of leg II (partially); 24. tibia and tarsus of leg IV.



Figs. 25–30. *Phihiracarus curiosus*, n. sp.: 25. prodorsum, dorsal view; 26. sensillus; 27. prodorsum, lateral view; 28. genitoaggenital plate (partially); 29. anoadanal plate; 30. trochanter and femur of leg I.



Figs. 31-32. *Phthiracarus curiosus*, n. sp.: 31. notogaster, lateral view; 32. cl seta.

notogaster: length 614, width 530, height 474, seta c_1 58, 2, setae h_1 and ps_1 43; genito-genital plate 151x121, ano-adanal plate 212x80, 8.

Color brown. Integument with very fine puncta.

Prodorsum with dorsal and lateral regions narrow and long. Lateral carina well developed and very long. Sensillus short, spindle-shaped, smooth. All setae thin, smooth and short, $in > le > ro = ex$.

Notogaster with fifteen pairs of normal setae, thin, short, $c_1 < c_1-d_1$. Setae c_1 and c_2 far from anterior border, seta c_3 near to anterior border. Vestigial setae f_1 situated dorsad setae h_1 . Only two pairs of lyrifissures ia and ip present.

Ventral region typical for superfamily. Infracapitular mentum with setae h very short, $h < h-h$. Genital setae arranged in two longitudinal rows with formulae: 4+3: 2. Five pairs of anal and adanal setae present, $an > ad_3$, setae ad_1 and ad_2 very short.

Leg setal and solenidial formulae of the "complete type". Setae a on tarsus I and a and ft on tarsus II are distally located.

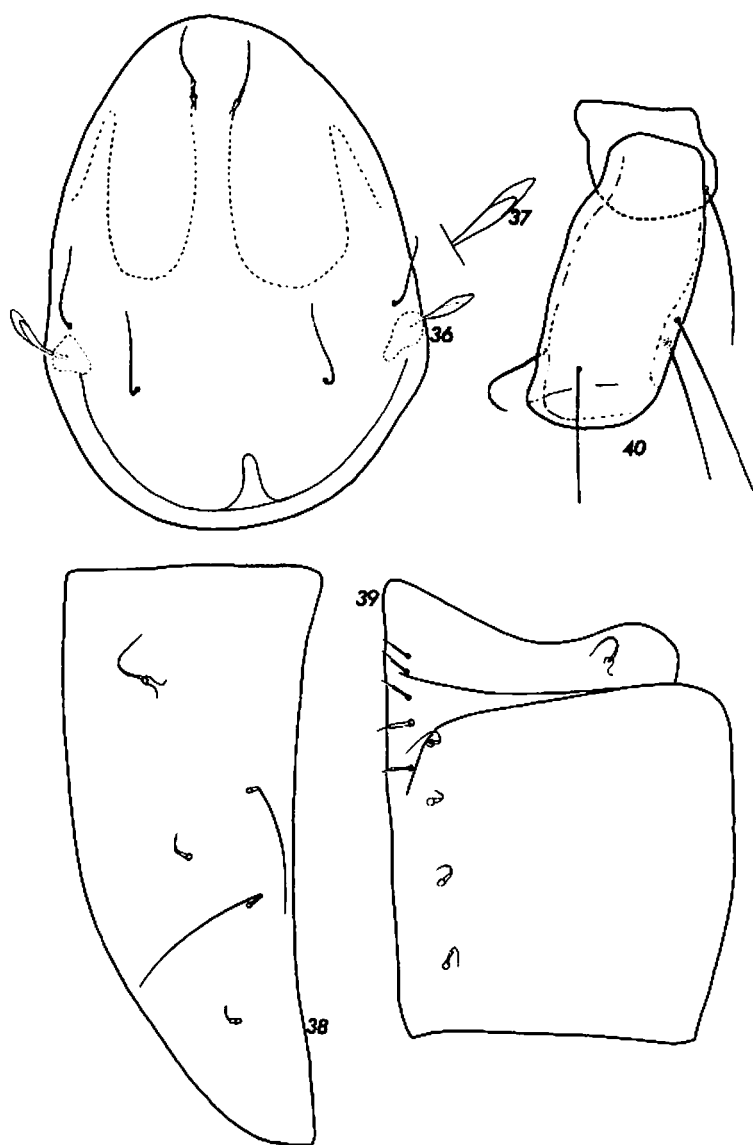
Remarks: This species is unique among species of *Phthiracarus* in having the following combination of character states: sensillus spindle-shaped, broad notogaster, short prodorsal and gastronomic setae, setae c_1 and c_2 far from the anterior margin of notogaster, adanal setae ad_1 and ad_2 very short.

Etymology: The word "plenus" refers to a broad notogaster.

Type data: Holotype (p.MLV) (BPBM 15,835) and five paratypes: HAWAIIAN ISLANDS: Hawai'i I., slope Hualalai, 6.x.1968, wet *Metrosideros* forest, thick, wet moss on a large lava block, J. Balogh.



Figs. 33–35. *Phthiracarus plenus*, n. sp.: 33. prodorsum, lateral view; 34. sensillus; 35. notogaster, lateral view.



Figs. 36-40. *Phthiracarus plenus*, n. sp.: 36. prodorsum, dorsal view; 37. sensillus; 38. anoadanal plate; 39. genitoaggenital plate; 40. trochanter.

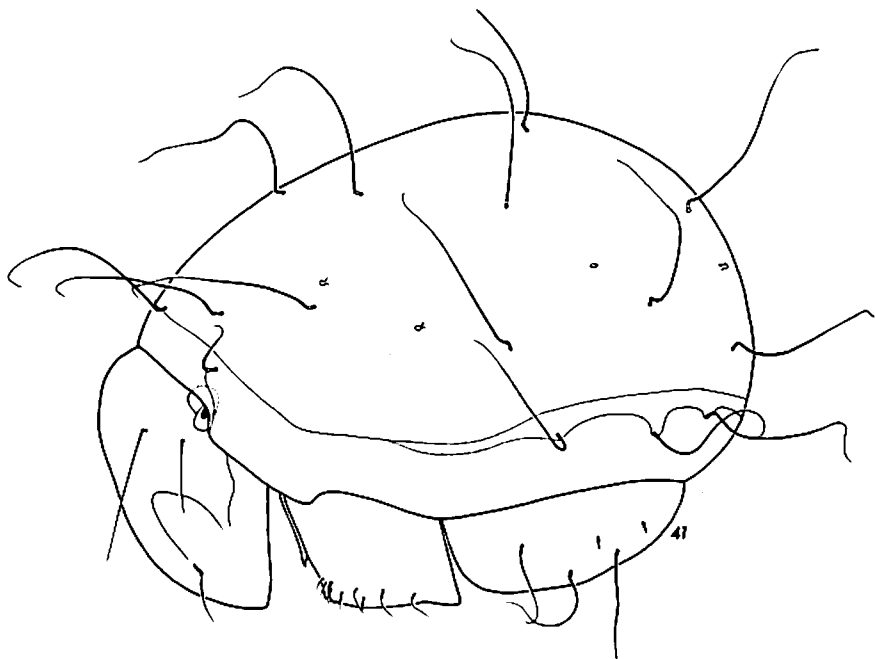


Fig. 41. *Phthiracarus reductus*, n. sp.: lateral view of body.

Holotype and paratype deposited in the Bishop Museum, Honolulu, two paratypes in the Department of Systematic Zoology and Ecology of the Eötvös Loránd University, Budapest, two paratypes in the Department of Animal Taxonomy and Ecology, University of Poznan.

***Phthiracarus reductus* Niedbala, n. sp. (Figs. 41–45).**

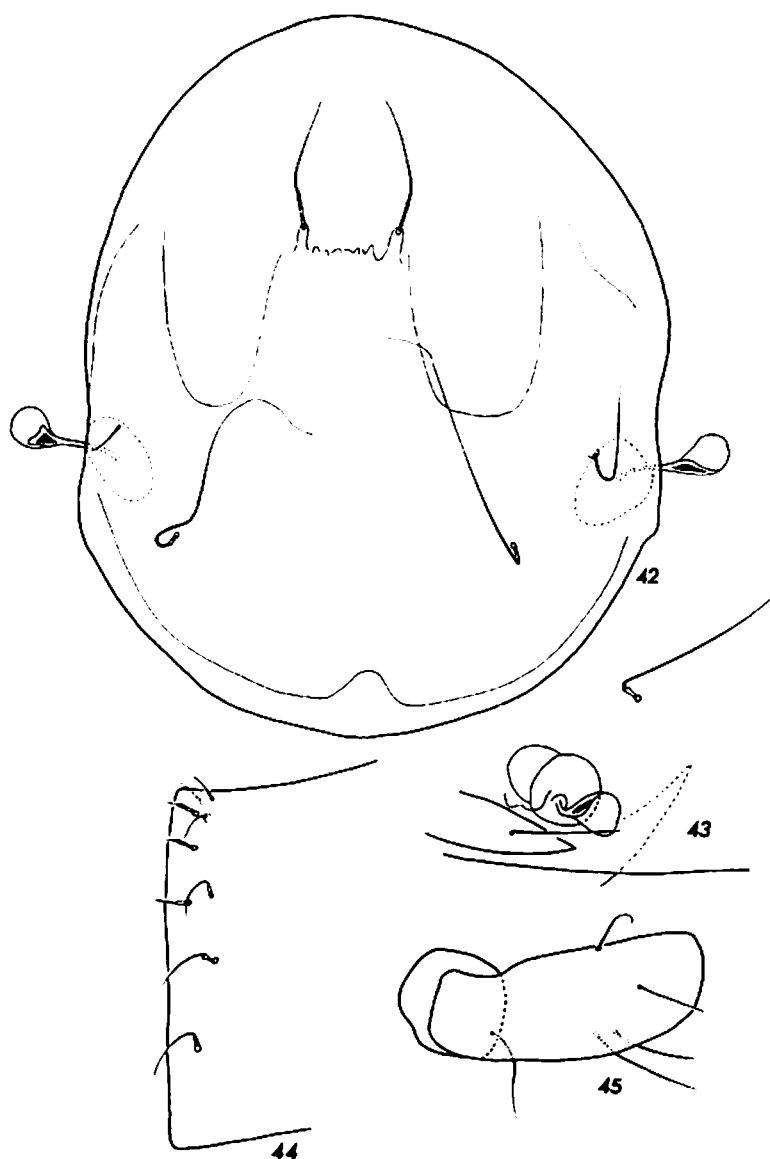
Measurements of holotype: prodorsum: length 266, width 205, height 129, sensillus 30, 4, interlamellar seta 126, lamellar and rostral setae 58, 2, exobothridial seta 37, 9; notogaster: length 532, width and height 342, seta c_1 190, seta h_1 182, seta ps_1 157; genitoaggenital region 126x111, anoadanal region 202x111.

Color brown. Surface of body punctate.

Prodorsum without lateral carinae. Dorsal region broad, not longer than lateral regions. Sensillus short, with narrow stalk and rounded, smooth head. Setae fairly long, smooth, $in > le = ro > ex$.

Notogaster with fifteen pairs of normal setae, long, thin, smooth and flagellate, $c_1 > c_1-d_1$, with seta c_3 shortest. Seta c_1 located near anterior border, seta c_2 remote from anterior border, seta c_3 placed on border. Vestigial setae f_1 situated ventrad setae h_1 . Only two pairs of lyrifissures ia and im present.

Ventral region. Epimeral region, infracapitulum, palps and chelicerae typical for superfamily. Infracapitular mentum with setae h very short, $h < h-h$. Genital setal formula is 4+3: 2. Anoadanal plates each with five setae, adanal setae ad_1 and ad_2 vestigial, anal setae ad_3 long and flagellate, $an > ad_3$.



Figs. 42–45. *Phthiracarus reductus*, n. sp.: 42. prodorsum, dorsal view; 43. sensillus with lamellar and exobothridial setae, lateral view; 44. genitoaggenital plate (partially); 45. trochanter and femur of leg I.

Leg chaetotaxy of "complete type". Dorsal seta *d* on femur I placed dorsoventrally on segment. Setae *a*" on tarsus I, *a*" and *ft*" on tarsus II bent distally.

Remarks: This species is similar to *Phthiracarus insularis* Jacot, 1935 from Tahiti and *Archiphthiracarus imbecilis* Mahunka, 1989 from South Africa on the basis of shape of sensillus. *P. insularis* however, has notogastral setae shorter and setae *c*₁ and *c*₃ remote from anterior border. *A. imbecilis* has different arrangement of setae of row *c* and arrangement of genital setae.

Etymology: The species name "reductus" is from the Latin for "remote", "distant", and refers to the remote geographic position of the species.

Type data: Holotype (p.MXLII) (BPBM 15,836) and 2 paratypes: HAWAIIAN ISLANDS, O'ahu I: Mt. Ka'ala summit, 1225m, 10.x.1989, ground moss with soil, S.F. Swift.

Holotype and one paratype deposited in the Bishop Museum, Honolulu; one paratype in the Department of Animal Taxonomy and Ecology, University of Poznan.

Phthiracarus swiftae Niedbala, n. sp. (Figs. 46–54).

Measurements of holotype: prodorsum: length 313, width 232, height 131, sensillus 27, 8, interlamellar seta 88, 5, lamellar seta 65, 8, rostral seta 63, 2 exobothridial seta 37, 9; notogaster: length 621, width 475, height 456, seta *c*₁ 405, seta *c*₃ 22, 8, seta *h*₁ 169, seta *ps*₁ 187; genitoaggenital plate 141x116, anoanal plate 212x106.

Color yellow. Integument finely punctate.

Lateral carina on prodorsum present or absent (present on 1 of 7 specimens examined). A weak median ridge developed on anterior part of prodorsum. Dorsal region longer than lateral region. Sensillus short with clavate, smooth head. All setae thin and smooth, *in>le>ro>ex*.

Notogaster with fifteen pairs of normal setae other than short seta *c*₃, thin, smooth, flagellate, *c*₁>*c*₁–*d*₁. Setae *c*₁ and *c*₂ remote from anterior border, seta *c*₃ positioned near anterior border. Vestigial setae *f*₁ inserted ventrad setae *h*₁. The normal complement of four pairs of lyrifissures *ia*, *im*, *ip*, *ips* present in usual location.

Ventral region. Infracapitular setae *h* slightly shorter than their mutual distance. Genital setal formula: 4+2: 3. Two anal and three adanal setae present, *an>ad*₃>*ad*₁ and *ad*₂. Seta *ad*₁ and *ad*₂ very short but normally developed in one of paratypes.

Leg chaetotaxy of "complete type". Setae *a*" on tarsus I, *a*" and *ft*" on tarsus II bent distally. Seta *d* on femur I inserted distally.

Remarks: This species is readily distinguishable from its congeners by the following features: weak median ridge on the prodorsum, arrangement of *c* setae, four pairs of lyrifissures, seta *d* on femur I inserted distally.

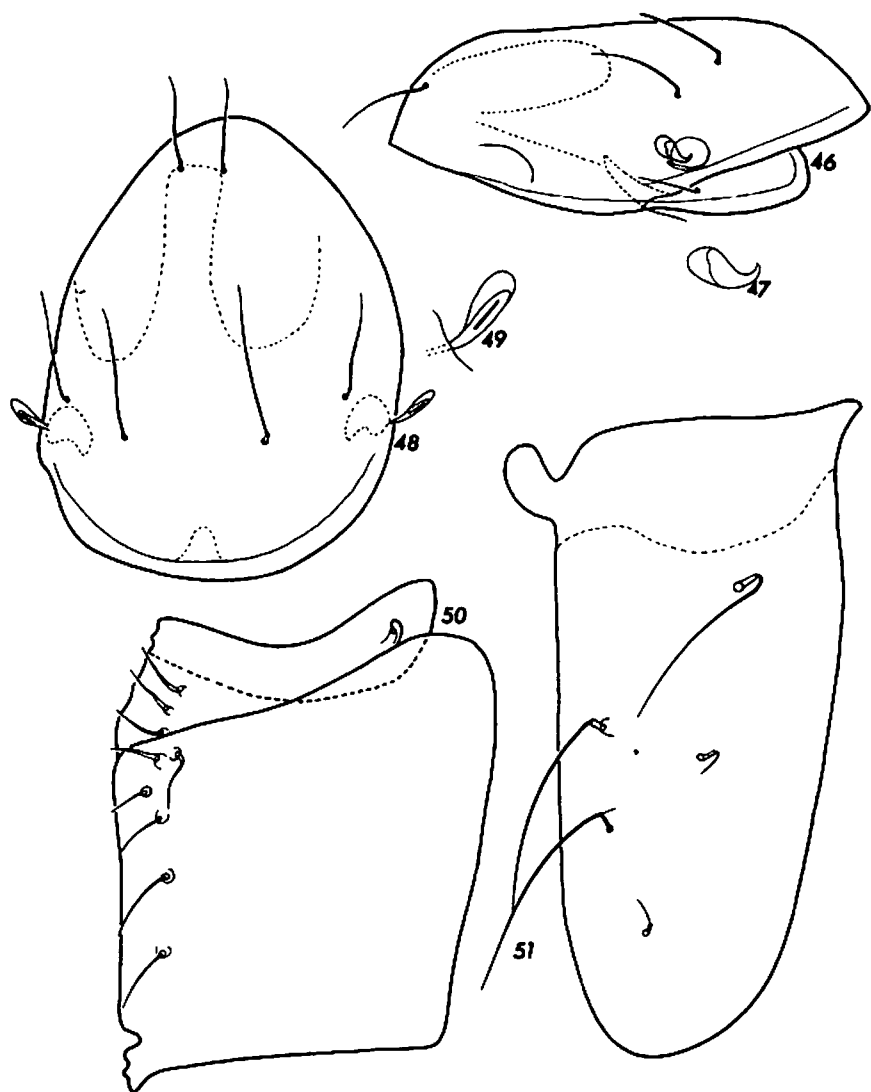
Etymology: This species is named in honor of Dr. S.F. Swift, Hawaiian Acarologist, collector of part of the studied specimens from this region.

Type data: Holotype (p.MLIV) (BPBM 15,837) and six paratypes: HAWAIIAN ISLANDS, Hawaii I., Kipuka on North slope Hualalai, 6.x.1968, 1524 m, *Metrosideros* forest, litter and roots under *Metrosideros* tree, J. Balogh.

Holotype and two paratypes deposited in the Bishop Museum, Honolulu, two paratypes in the Department of Systematic Zoology and Ecology of the Eötvös Loránd University, Budapest, two paratypes in the Department of Animal Taxonomy and Ecology, University of Poznan.

ACKNOWLEDGEMENTS

I wish to express my sincere thanks to Prof. J. Balogh and Dr. S.F. Swift for the loan of materials and to Dr. V. Behan-Pelletier for her valuable advices concerning manuscript. I thank also Dr. S.F. Swift for the SEM photo of *Atropacarus (Atropacarus) striculus*.



Figs. 46–51. *Phthiracarus swiftae*, n. sp.: 46. prodorsum, lateral view; 47. sensillus; 48. prodorsum, dorsal view; 49. sensillus; 50. genitoaggenital plate; 51. anoanal plate.



Figs. 52-54. *Phthiracarus swiftae*, n. sp.: 52. notogaster, lateral view; 53. mentum of infracapitulum; 54. trochanter and femur of leg I.

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